1 Executive Summary

The world of freight transportation continues to change as trade between countries increases. Today, few agricultural products are produced solely in one country or region. Global movement of agricultural products is the norm with the flow of product hinging more on access to – and the cost of -- transportation to market than any other single factor.

This research was undertaken to explore a range of approaches to reduce the inland cost of transportation of agricultural products both to nearby export ports and other West Coast ports. These ports provide critical portals to ocean carrier service required to reach export markets.

Well over half of the volume of the Western U.S. agricultural industry is exported, primarily to markets in the Pacific Basin. Without cost effective transportation to export markets agriculture in the Western U.S. would be significantly smaller than it currently exists.

Differentials in inland cost of transportation can make or break an international transaction. When the value of the agricultural commodity in a forty foot ocean container is approximately $5,000 and the inland cost of transportation is $500 above the competition, very few offers are accepted except in cases of product shortage or disruptions in the logistics system.

This report compares barging to trucking, not barging to rail. In the U.S., by ton-miles, rail moves 40 percent of freight although trucks move 71 percent of the tons; trucks just move them overall for a shorter distance. On the other hand barging accounts for 7 percent of the ton-miles in the U.S. compared to over 41 percent in the European Union. This report studied the European experience of high utilization of barging to move cargo and compares this to the Pacific Northwest with its range of inland waterways and ports.

The report identifies the candidate cargos and volumes for weekly-containerized common carrier barge service. Among candidate cargos in addition to the core agricultural commodities and products previously cited are: hay, animal feed, paper products, lumber, toys, tires, footwear, apparel, consumer electronics, furniture and auto parts.

Candidate cargos are those that are dense, often requiring heavier container chassis and can withstand the three times greater transit time than truck.

The cost models developed in this report demonstrate under the stated assumptions that tugboat-barge costs for the equivalent miles (1000 statute miles) range between 19 and 38 percent below truck costs to transport equivalent commodities.

At the same time, the report finds sufficient cargo moving along the Pacific Coast to support a weekly-containerized common carrier barge service. The expected growth in cargo provides for multiple schedules as the weekly service is proven to provide the required dependability of a fixed schedule sailing and arrival.

The cost models can be applied to most ports in the Pacific. One element this model incorporates that was not found in existing tug-barge services is the shipper's association being signatory to the charter party, providing significantly reduced line-haul FEU cost from commitment to a time charter, whether six months or longer.

The shipper association would absorb the risk of sailings at barge capacity, rather than the tug—barge operator; hence the shipper's association risk-reward provides for the significantly lower FEU costs.

Although the research findings identified the West Coast of the Pacific Ocean, the economic conditions outlined are applicable to other coasts of the U.S. One present application is in the Gulf of Mexico from Tampa to New Orleans where the direct water route is shorter than the circuitous rail/highway route. Here an Articulated Tug and Barge (ATB) transit time is 3 days for the 494 miles in straight line as compared to 7 days for the circuitous rail route of 705 miles. And the ATB rate for 5,000 to 37,000 ST can range from 50 to 29 percent of similar rail rates.

The findings and recommendation of this report suggest a three step phasing in of ocean barging using existing equipment for export cargoes, then domestic cargoes, with the third phase implementing newly constructed ATBs. The addition of foreign cargoes will foster inland distribution centers on waterways for stripping straight loads inbound and building domestic freight of all kinds for movement to Midwest distribution centers.

2 Acknowledgements

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My apology if any person was inadvertently overlooked and not acknowledged.

Information was gathered from the above persons and organizations with the caveat that sources would not be disclosed to protect confidential operational information unless specific permission was given to identify the source in the report.

3 The Model

Model Implementation Six Months Cost (1000 Miles)

Fixed Costs (Financial Obligation)	
Conventional Towed Barges	
Time Charter	$4,461,704 to $6,219,096
Articulated Tug-Barge Time Charter	$8,710,000
Container Lease	$162,000
Variable Costs (No Financial Obligation)	
Dockage	$145,600
Wharfage	
Inland Port	$640,000 to $1,248,000
and/or	
Lower Columbia River Port	$1,716,000 to $3,432,000
Long Beach, CA	$2,340,000 to $4,680,000
Total Financial Obligation	$4,623,704 to $8,872,000
10 Core Shipper Risk	$462,370 to $881,200

Model Implementation Six Months Cost (572 Miles)

Fixed Costs (Financial Obligation)	
Conventional Towed Barges	
Time Charter	$2,595,216
Articulated Tug-Barge Time Charter	$4,062,032
Container Lease	$162,000
Variable Costs (No Financial Obligation)	
Dockage	$145,600
Wharfage	
Inland Port	$640,000 to $1,248,000
and/or	
Lower Columbia River Port	$1,716,000 to $3,432,000
Seattle/Tacoma	In Ocean Carrier Rate
Total Financial Obligation	$2,757,216 to $4,224,032
10 Core Shipper Risk	$275,722 to $422,403

According to the Merriam-Webster Dictionary a model is a miniature representation of something. It is also a pattern of something to be made.

This model is based on a set of assumptions derived from research of the industry and input from the industry. The model is designed as a “straw man”; to be criticized and reshaped to the consensus of the industry. Each assumption is to be challenged until a common ground is reached, i.e., is 1 gallon per horsepower per 24 hours for the older tugboats best or is 0.90 for the newer or 0.80 those not using maximum of the tugboat available horsepower because the combination of tug-barge is overpowered?

The model in this report specifies two water routes: (1) from the Pendleton area of Oregon along the Columbia River to the Long Beach/Los Angeles area and (2) from the Pendleton area to Tacoma, WA. The routes are specific so that readers will have an image to grasp but the cost assumptions can apply to other routes.

The operational model in this report is a door to door transportation service utilizing public and private ports, leased containers and time chartered tugs and barges; both those from existing equipment and those to be newly constructed.

The model uses U.S. Army Corps of Engineer’s Inland Waterway Resources’ costs and does not consider whether crews are represented by labor organizations. Port personnel are assumed to move 30 containers per hour for a 24 hour turn on the barge by employing additional container cranes or lifts (top-picks, forklifts, etc. used in Pass-Pass operations). The IWR costs are a blend of the industry, reflecting both new and older equipment. IWR costs use 8 crewmembers for 3000 HP tugboats and 9 for higher HP tugboats.

The model uses a fuel consumption factor of 0.90 gallons per horsepower per 24 hours when loaded underway. Speeds vary from 7 knots to 12 knots.

Weather days have not been included. Some ATB operators report 10 weather days in a year on scheduled runs.

It is a blended model. The preferred model would be a completely captive system as found in barge operators in the Alaska and Puerto Rico trade. The delivery equipment and containers are company owned or leased; company labor operates the private terminals at both ends of the route and tugboat crews have flexibility to assist in remote port discharge. Terminal operations use container lifting equipment for the Pass-Pass technique of loading and unloading, avoiding the high capital cost of container cranes. Simple ramps and perches are used instead. The captive system gives complete control of all segments (to include security) to management whereas the blended model loses management control at public ports that are sovereign authorities determining operating hours, security procedures, etc.

The model does not add external and environmental costs to the truck cost. The external costs for the 1000 miles was quantified at $167.80
The environmental cost in ounces of pollutants per capita was quantified in terms of human health values but not monetized. The cost of un-recovered highway use cost was identified as a minimum of $215 for the 1000 miles but not added to truck cost. The reader can add these costs on the base of $1,410 if desired. The cost models show barging cost effective without addition of external costs and un-recovered highway use cost. The addition of external costs, environmental costs and un-recovered highway cost use, especially over-weight trucks, is left to government agencies and legislative bodies to address.

4 Cost Model(s) [Please refer to Barge Cost Section for Values Shown]

- 1000 miles base model (Portland, OR area to Long Beach, CA); 572 miles (Pendleton, OR area to Tacoma, WA via Columbia River and Straits of Juan de Fuca)
- 1000 miles Barge from $875 to $1,147 per FEU of 55,000 pounds
- 1000 miles Truck comparison of $1,410 per TL of 48,000 pounds
- Towed Barge(s) and ATBs cost comparison
- 1300 miles Barge at $1,204 per FEU of 55,000 pounds; Truck at $1,661 per TL of 48,000 pounds

Inland Columbia River Port to Los Angeles/Long Beach area (Domestic Freight)

For costs via water the following categories are considered:

1. Commercial drayage of container/trailer within 50 miles of loading port: $150 per FEU
2. Inland port loading of container/trailer: $40 per FEU
3. River towboat to loading port for ocean transfer: $250 per FEU
4. Ocean barge loading port wharfage, handling and dockage: $110 per FEU
5. Ocean barge time charter: $300 per FEU
6. Destination port wharfage and handling (throughput): $150 per FEU [based on Port of Long Beach, CA Tariff No. 004, Page 2,000,065, Rule 34-C, Section 3 Wharfage, Item 315 Exception Cargo 40' $147, Note 3: Foodstuffs, Canned and Bottled; Fish and Shellfish, Frozen, etc.]

7. Destination commercial drayage from port to distribution center: $175 per FEU

8. Storage and Interest on 7-14 days inventory: $85 per FEU

9. Container lease for 14 days: $34 per FEU

10. Port dockage fee for 600' of barge: $5 per FEU

11. Shipper's Association Booking Fee: $50 per shipment; $7 per FEU

12. Private fleet drayage 50 miles to/from port at $1.84/mile: $92 per FEU

Voyage costs 1. – 11. equal $1,306 per FEU

River Ocean Loading Port to Los Angeles/Long Beach area

1., 4., 5., 6., 7., 8., 9., 10., 11 equals $1,016 per FEU

Private Company Inland Origin and Destination Fleet Tractor Drayage

12., 2., 3., 4., 5., 6., 8., 9., 10., 11., 12 equals $1,115 per FEU

Private Company River Ocean Loading Port to Los Angeles/Long Beach area

12., 4., 5., 6., 8., 9., 10., 11., 12. equals $875 per FEU

ATB from Inland Port to Los Angeles/Long Beach area

1., 2., 5. ($558), 6., 7., 8., 9., 10., 11. equals $1,204 per FEU

ATB from River Ocean Loading Port to Los Angeles/Long Beach area

1., 4., 5. ($431), 6., 7., 8., 9., 10., 11. equals $1,147 per FEU

Inland Columbia River Port to Tacoma, WA area (Export Freight)

For costs via water the following categories are considered:

13. Commercial drayage of container/trailer within 50 miles of loading port: $150 per FEU

14. Inland port loading of container/trailer: $40 per FEU

15. River/Ocean barge time charter by existing equipment: $294 per FEU with 10 percent of the containers missing the sailing. [Estimate if using a newly constructed $10 million 84' by 565' barge with a 5000 horsepower tugboat of 420 FEU capacity sailing with 294 FEU is $288 per FEU]

16. Destination port wharfage and handling (throughput): None, export cargo wharfage charges are absorbed by the ocean carrier.

17. Storage and Interest on 6 days inventory: $38 per FEU [Interest for 385,000 pounds of freight at $0.50 value per pound for 6 days at 10 percent is $45.19 per FEU less one day (truck intransit time) interest of $7.53 for a $37.66 per FEU. There is no storage cost for export cargo.]

18. Container lease for 14 days: None, ocean carrier containers will be used.

19. Port dockage fee for 600' of barge: None, absorbed by ocean carrier in rate.

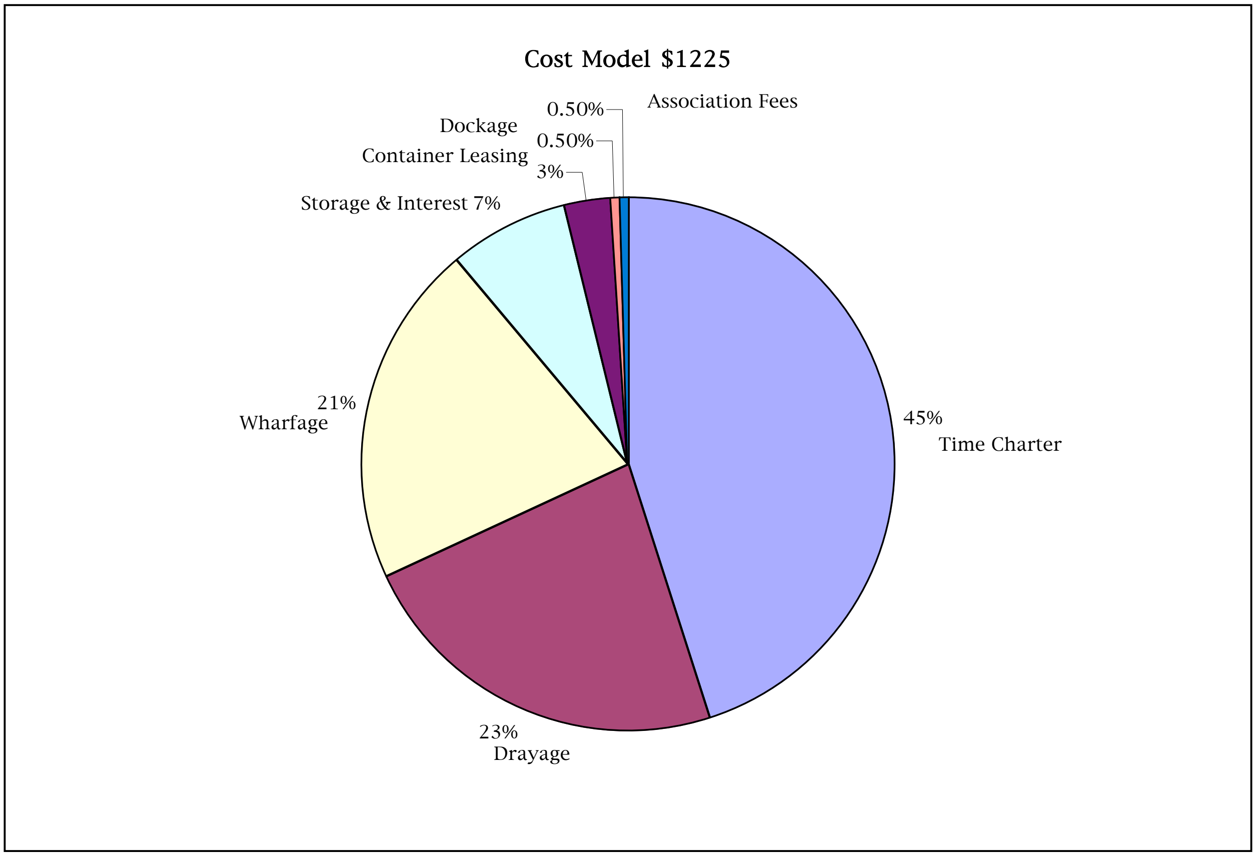
20. Shipper's Association Booking Fee: $50 per shipment; $7 per FEU

13. – 20. equals $529 per FEU; if a 84' by 565' barge is used the estimate is $523 per FEU with 30 percent of the containers not making the sailing.

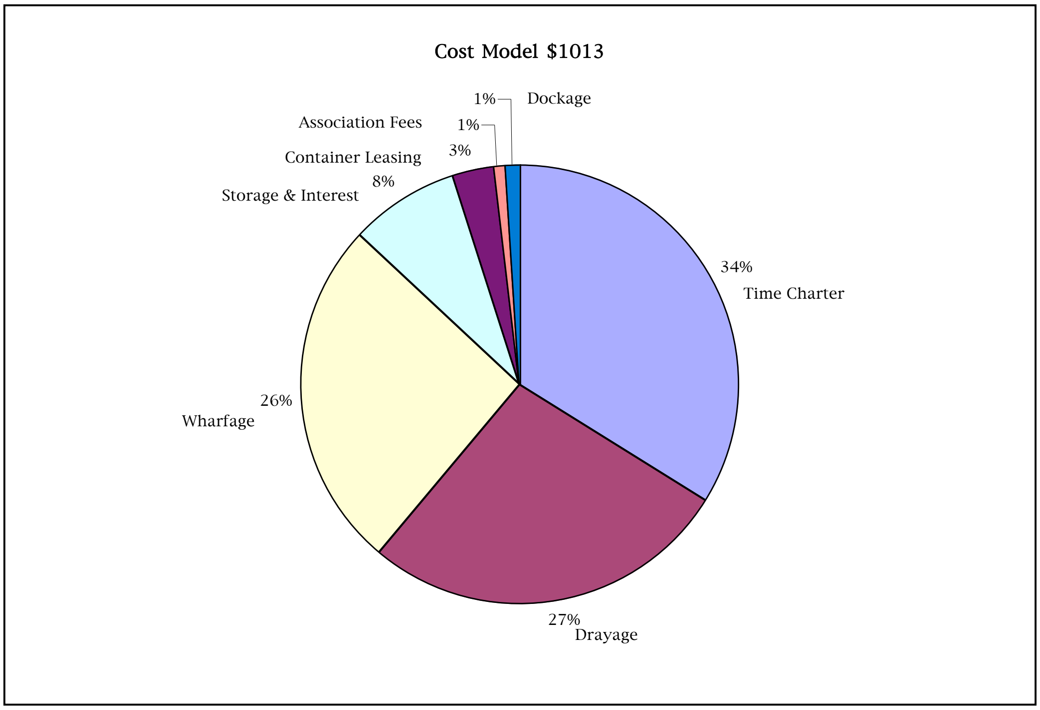
However this scenario needs to be adjusted by the shortage of cargo available on the return of the tug-barge. Should import cargo be available for the box store distribution center in the up river area, then the possibility of half capacity could be revenue cargo and half repositioning of ocean carrier containers at an estimated revenue of $50 per empty FEU.

The $529 per FEU for existing equipment would be adjusted to $630 per FEU and the $523 per FEU for a new 565' barge would be adjusted to $569 per FEU.

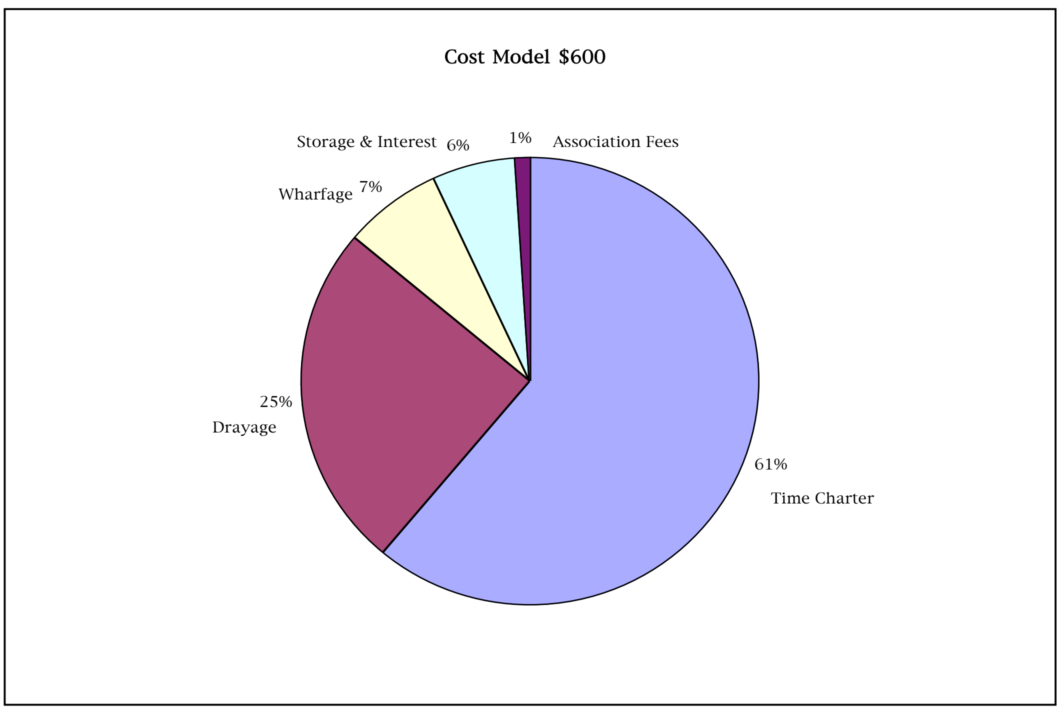
Averaging the costs from the Pendleton area to Long Beach, CA the graph would look like:



Averaging the costs from the Lower Columbia River to Long Beach, CA the graph is:



Averaging the costs from the Pendleton area to Tacoma, WA the graph is:



5 Necessity for Short Seas Shipping

For inland agricultural exporters, the future of the Columbia River and Snake River System can determine if they will be competitive in world markets. For shippers in Idaho and Montana; Lewiston, Idaho starts the Snake River waterway of 140 miles to the Columbia, which continues 243 miles to Portland, Oregon. The 383-mile channel is maintained at 14 feet. From Portland to the Pacific Ocean, a distance of 106.5 miles, the channel is maintained at 40 feet deep by 600 feet wide. At the mouth of the Columbia the channel is maintained at 55 feet.

The U.S. Army Corps of Engineers Report at Appendix C -- Economics, Figure 3 demonstrates the cost reduction measures in TEU for container ships of drafts ranging from 30 to 43 feet. At page 39 an explanation is given "Figure 3 taken from the Fleet Forecast for the Columbia River to 2020 that was done by Martin O'Connell Associates for the Port of Portland, shows the dramatic differences in required freight rate for different container vessel sizes. This difference for a 3,000 TEU and a 4,350 TEU vessel can be as much as $200 per TEU or a 33 percent reduction in rates. For larger variances in vessel sizes, the cost difference can be even more dramatic."

Are these "scare" forecasts of larger ships and the cost differentials derived from economies of scale? From the Port of Long Beach's Annual Report 2002, the container terminal acreage amounts to 1288 acres with Hanjin's container terminal T alone occupying 375 acres. To this we add neighboring Port of Los Angeles's 1616 acres for a total of 2,904 acres of container terminals. This is 5.3 times the acres of combined T-6 and T-2 of the Port of Portland.

The Port of Long Beach regarding the seven container terminals: "Existing container terminals in the Port of Long Beach have a combined maximum practical capacity of 6,454,000 TEU's per year. Since the Port is expected to handle between 12,138,500 and 16,638,500 TEUs in year 2020, container terminal capacity needs to be increased between 5,684,500 and 10,184,500 TEUs by the year 2020". A side note: the initial double towed barging implementation of 1200 TEUs for 52 weeks amounts to 62,400 TEUs or between 0.6% to 1.1% of the expected increase in the Port of Long Beach's growth. For comparison, in 2003 the Port of Portland inbound TEUs were 73,185 and outbound TEUs were 265,756 (1:3.6 ratio) for a total of 339,571 TEUs. The total outbound TEUs amounts to 32 – 8200 TEU ships in service in Long Beach or less than one per week.

While in Rotterdam, researching EU-SSS, it was noted in the publication “Port of Rotterdam” that OOCL Rotterdam is the largest container ship in the world with a container capacity of 8063 TEU and a draft of 13 meters (42.65 feet). However it was noted “It is common knowledge that China Shipping will have ships with a capacity of around 10,000 at its disposal and if the rumors are correct even ships of 12,000 TEU will soon be ordered.”

Also in Appendix C is Table 22 identifying drafts at West Coast ports: Seattle 60’; Tacoma 50+; Vancouver, BC 50+; Oakland 42’; Long Beach 45’ and Los Angeles 45’.

Thus we see the future of freight rates and the need of inland shippers to anticipate more favorable ocean container rates at deep-water ports as larger vessels are placed into service.

Surveys of agricultural exporters report that at present unfavorable ocean rate differentials exists between Portland and Seattle-Tacoma and also Portland and Long Beach/Los Angeles. The same survey indicated that “leakage” from the Snake/Columbia System moving overland via rail or truck to Puget Sound is up to the same amount on the river, which was in 1997 according to Appendix C 186,633 TEU outbound at Portland. The outbound TEU amounted to 2,654,157 short tons. Added to the TEU tonnage is 16,532,600 short tons of outbound wheat, barley, and corn. Thus we see the weakening of the towboat industry on the Columbia/Snake System.

Even within the agricultural community, the value of the inland water transportation is underestimated or not recognized at all. For example, as of the date of this report the rates for a ton of grain to move 187 miles down river to export elevators are: by barge $7.02; by rail $12.83 and estimated for truck at $24.57 (very seldom does grain move by truck to export terminals other than from inland grain elevator to river elevator).

Thus we see that barging is critical to: (1) maximizing return to the producer since inland transportation costs and handling costs are derived (subtracted) from the ex spout price at the ocean export elevator, (2) providing critical competition to the rail mode to keep rates low and (3) providing the tow capacity for export container movement of value added agricultural products such as processed potato products.

For dry value added product with a value of approximately $0.40 per pound moving down river 170 miles the barge container rate is $244 plus a 15% fuel surcharge for a total of $280.60. The ocean container via barge routinely holds 55,000 pounds; hence the value of the product is $22,000. The current truck charge for an ocean container holding 43,000 pounds (without super chassis) for the same distance is $450 plus a 12% fuel surcharge for a total of $504 with the value of the product at $17,200. When a super chassis is used the rate is $525 plus a 12% fuel surcharge for a total of $588. The agricultural product company reports that depending upon the trucking company used, a super chassis rate may be as high as $625 plus a 12% fuel surcharge for a total of $700.

Since this product is an ingredient and manufactured in other countries of the world, the difference of inland transportation via barge at $280.60 versus a truck high of $700 (a differential of $419.40) is critical to maintaining foreign markets.

Even more price sensitive is hay grown in the same region. On this date, USDA AMS reported alfalfa for export at $132.78 per ton with an estimated compression charge of $30 per ton; the ocean container value would be $4,494.33. In this example, we definitely see $419.40 inland transportation cost disadvantage as a direct reduction in the producer's return and a major threat to loss of foreign markets to such countries as Canada. In addition if we note the difference of $400 per FEU from larger vessels shown above then a market distortion of $919.40 on a commodity value of $4,494.33 or 20.5 percent means U.S. producers are non-competitive.

A good example of the application of Short Seas Shipping in the U.S. is the movement of bulk fertilizer in ATBs from Tampa to New Orleans. The range of fertilizer tonnage is from 5,000 to 37,000 short tons (ST), which is provided by the four to six holds of the ATB. The rate per short ton via ATB is $7 to $10 per ST compared to rail at a rate of $14 per ST. The direct water route is 494 miles as compared to the rail route of 705 miles. And the Short Seas Shipping time is three days compared to the rail intransit time of seven days.

From a Capital Press Agriculture Weekly article of August 6, 2004 titled "Loss of shipping line means headache for NW" about the suspension of ocean service by Hyundai Merchant Marine, leaving only two ocean carriers calling on Portland (Hanjin and K-Line) Pat Boss, Executive Director of the Washington Potato Commission stated: "From a competitive standpoint and an economic standpoint, its far better to have shipping by barge to the steamships as opposed to having to ship by truck or by trains to the other ports, he said. It's very hard anymore even to get rail cars, let alone get decent rates with the Class I railroads. The downriver barge traffic really keeps things competitive across all different modes of transportation."

It is overwhelmingly apparent in these examples that barging is essential for maintaining U.S. producers in foreign markets.

6 Types of Ocean Tugboats and Barges

Open water deck barges are of the size 400' in length and 100' in breath with a loaded draft of 14' (overall depth of 20' to 23') containers are stacked three high and lashed by chains. The capacity is 320 FEU. It is possible to stack four high. Tugboat horsepower is generally under 5000 horsepower. For the Alaska Inland Passage a double tow is possible because of protected waters and multiple stops enroute. However, open water double towing is not recommended during severe weather conditions. An alternative open water combination is a deck barge of 285' in length by 78' in breadth pulled by a 3000 horsepower tug. For a tow of 738 statute miles (641 nautical miles) the time is 4-1/2 days. Current cost of ocean deck barges of the size 400' by 100' is between $8 million and $9 million. Barges to be placed in domestic coastal service must be built in the U.S. and be American flagged. 5000 horsepower tugboats are currently being built at $8 million to $10 million.

(Photo courtesy of Northland Services, Inc.)

For years, Alaska has been serviced from Seattle by a towed deck barge with up to 48 railcars lashed on the deck rails. Recent improvements have been to carry 120 FEU on a superstructure above the railcars.

A combination of open propeller tugboats and Roll-on Roll-off barges has been used in the Puerto Rico trade for over 30 years. Typical are the Crowley La Princesa which is a three-deck barge with a capacity of 398 FEU. Length is 580’ and breadth is 105’ (wider than the Columbia River locks (84’ by 650’). Loaded draft is 12’. A longer version is Fortaleza which is 730’ long by 100’ breath and loaded draft of 10.1” Capacity is 512 FEU. The pictures, Courtesy of Crowley Maritime, show the Ro-Ro triple deck barges being pulled by the Invader Class tugboats. This class of tugboats are twin screw 7200 horsepower total. Length is 136’ with breadth of 36’ and loaded draft of 20’ Fuel consumption is 7200 gallons per 24 hours when towing. Tow wire is 2-1/4”. The sailing schedule is 5-1/2 days for the 1278 statue miles (1111 nautical miles) or 9.7 MPH

(Photo courtesy of Crowley Maritime)

(Photos Courtesy of Crowley Maritime)

(Photo courtesy of Crowley Maritime)

The Invader Class tugboat Patriarch appears small in relation to the triple deck trailer barges but has 7200 horsepower delivered through 5-bladed stainless steel propellers for the necessary torque.

A visit aboard one of Western Towboats at Whittier, Alaska after the arrival of Alaska Marine Line's rail and container barge showed how spacious accommodations are for the crew.

There is a separate discussion of Articulated Tug-Barges, which are the equivalent of "Handy-Size" ships with capacity of up to 42,800 short tons, pushed by a tugboat of 7200 horsepower. The lengths are as long as 652' and breadth up to 93' with loaded draft of up to 36". These ATBs have multiple holds providing the ability to have a mix of commodities and containers.

The following three photos are courtesy of TECO Ocean Shipping.

(Photo courtesy of TECO Ocean Shipping)

The third picture is of a Integrated Tug-Barge (ITB). An ITB is a "rigid" coupling, with the tugboat rolling and pitching with the cargo unit. ITBs require pilots and lifeboats. ATBs can separate from the cargo unit and recouple with another cargo unit. ITBs generally do not decouple, except for maintenance.

Shown above is the TECO M/V Janis Guzzle with barge Marie Flood having particulars of: 7,200 horsepower, 6 holds and 12 hatches, overall length of 652 feet and breadth of 85 feet, loaded draft of 32 feet, short ton cargo capacity of 37,000.

Shown below is the barge Marie Flood taking on agricultural products for delivery to developing countries throughout the world. She is classified as A.B.S. Highest, all oceans.

(Photo courtesy of TECO Ocean Shipping)

(Photo courtesy of TECO Ocean Shipping)

The above combinations are in service today and the equipment is available to place into West Coast containerized common carrier weekly service.

The future of ocean barging may include a concept mother vessel termed the Flow-on Flow-off. The vessel would ballast down for deck submersion and deck barges would be floated on. After ballast up the vessel would sail for destination port and reverse by ballasting down and barges pushed to dockside.

7 Articulated Tug-Barge (ATB)

INTERCONTINENTAL Engineering-Manufacturing Corporation, a manufacture of the INTERCON Coupler Systems for 34 ATBs, has been very helpful in describing the advantages of ATBs compared to ocean towed barges.

- Permits pushing in a wide range of sea conditions.
- Increases speeds 35-40% over towed units.
- Fuel savings are enhanced by wheel and rudder efficiencies.
- Tug engages and disengages without crew on deck.
- Eliminates expense and hazards of hawsers, headlines and straps.
- Easy and safe access from tug to barge at sea.
- Comfortable ride resulting in less crew fatigue.
- USCG approved for Dual Mode (push and also tow).

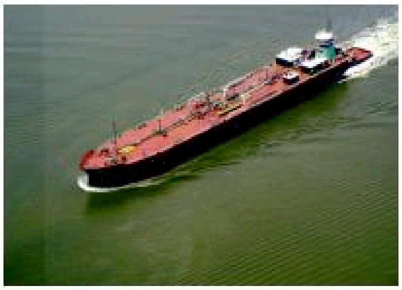
These advantages can be summarized as providing economies of pushing, flexibility, speed capabilities, improved transit predictability, and a degree of safety in operations not found in traditional tug/barge operations.

Another description is furnished in Harbour & Shipping, January 2004, p. 39: “By using an ATB instead of a traditional towing system, the tug is offered protection against the weather, there is less drag on the barge since no tow line is used, fuel usage become more efficient and the handling of the entire unit is enhanced.”

Regarding rough seas: “ATBs operate frequently in seas over 20 feet, and have been successful in very rough weather. The Maritrans’ Intrepid/Ocean 250, for example, made news in 1987 by pushing in a Gulf storm with waves reported at 35 feet.”[i]. At present, the Tug Intrepid, operated by MARITRANS, is 6,000 HP, 136 feet in length and is coupled to Barge M252 carrying petroleum products, 30,741 DWT and 546 feet in length.

In meeting with a West Coast ATB petroleum operator with a fleet of four 155,000 barrels capacity per barge of the size 512’ length and 78’ beam pushed by a tug 126’ length, 9280 horsepower (605’ coupled) it was discovered that ATBs have superior aspects for both the operator and shippers and receivers of freight. ATBs are more reliable in rough seas, meaning fixed schedules are met more often. After two years of operations from Southern California to the Pacific Northwest (to include crossing the Columbia River bar to Portland) the fleet has experienced and average of 6-10 weather days per year.

ATB PHOTOS



CROWLEY – SEA HAWK - 99270

CROWLEY – SEA RELIANCE - 99265

CROWLEY –
OCEAN RELIANCE
3 VIEWS

(ATB Photos Courtesy of Intercontinental Manufacturing and Crowley Maritime)

Crossing the Columbia River bar in 18-foot swells is routine. When swells of up to 22’ are reported, the captain confers with headquarters. Petroleum barges, although double hulled, use pilots to minimize the possibility of environmental damage. Other ATBs such as dry bulk do not use pilots.

The operator reports the crew is less fatigued because of the coupled tug; certainly a safety enhancement.

ATBs have been in service on the East Coast for over 25 years; also used in the Gulf of Mexico between the mouth of the Mississippi and Florida. They are a recent addition to the West Coast.

Towed barges when encountering eight-foot seas reduce to six knots whereas an ATB encountering 15’ seas continues at 11.5 – 12 knots. It is interesting that when the ATB leaves the harbor the acceleration to 12 knots is rapidly attained, the response time is minimal although pushing 21,800 short tons.

Time enroute from Long Beach/Los Angeles to Portland is 3.5 days; to Anacortes is 4.5 days. With team driver trucks now taking approximately 22 hours (1000 miles at 45 MPH), the ATB transit time is within a greater acceptability range for a number of candidate cargoes.

The crew of eight for the petroleum ATB consists of Captain, First and Second Mate, Chief Engineer, two Able Body Tanker Seamen and two Utility Seamen, one of which is the cook.

For ATBs not carrying petroleum, a crew of seven is possible. The Seamen’s International Union represents the entire crew.

Petroleum ATBs are limited in size by the need(s) of the trade. Larger sized ATBs (in length and beam) are possible from operational aspects with the exception of the dock length. With a well barge, a stacking of five containers would be possible with three in the well (the loaded petroleum barge draft is approximately 27 feet) and two layers lashed above the deck. Thus 1200 TEU or 600 FEU could be carried by a barge of the same approximate dimensions with passage through the Columbia River locks of maximum size of 650 feet by 84 feet. Operationally, it may be possible for three layers of containers in the well to provide the clearance of 14 feet in the channel since the containers will be light compared to petroleum. 360 FEU could be well loaded in the up river ports giving draft and bridge clearance and 240 FEU could be deck loaded in lower Columbia River ports for the ocean voyage. A change in tugboats may be required to meet the 14-foot draft of the channel above Portland.

ATBs have the advantage of the crew being able to safely move to/from the barge. Regarding reefer equipment and the movement of livestock, this is a positive for the ATB, although the East Coast petroleum trade does have crewmembers on towed petroleum barges.

The petroleum ATB barge has a loaded draft of 27’ and the tugboat at 21’. ATBs have a ship’s bow as compared to the towed deck barge having a rake bow. Propulsion is by twin 4640 horsepower Caterpillar diesels through open five bladed new generation fixed pitch 144-inch diameter propellers. The two outboard rudders when looking downward are fish shaped.

It is believed this size of ATB could meet the same schedule with 7000 horsepower. The difference of 2280 horsepower is for maneuvering. The ATB is operated at full power with fuel consumption at 8400 gallons per 24 hours, or a ratio of 0.905 gallons per horsepower per 24 hours. At the recent high of $1.50 per gallon (#2 diesel) the 3.5 day run to Portland using 7000 horsepower, cost of fuel would be $33,258 instead of $44,100.

It was agreed that ATBs are the future; towed barges will remain for project cargoes, those of large dimensions and weight such as pumping stations, cranes, beans, etc.

At a visit to a bulk ocean carrier that operates both ATBs and self-propelled ships, it was recognized that ATBs are the equivalent of “Handy Size” ships. The company operates 11 ATBs ranging in short ton capacity from 19,200 ST to 42,800 ST using horsepower from 4200 HP to 7200 HP. The three ships have a capacity in short tons from 33,500 ST to 41,000 ST using horsepower from 12,000 HP to 15,600 HP. Loaded draft of ATBs ranged from 25 feet to 36 feet compared to the ship’s draft ranging from 33 feet to 35 feet. ATBs were reported to have a speed of 10-11 knots whereas the ships speed ranged from 14-15 knots. The ATBs sailed the same oceans as the ship. Two differences were reported: ships require lifeboats and pilots. The tugboat of the ATB is de-coupled for maintenance.

As reported by other ATB operators, this company's ocean going ATBs have a crew size of 7-9 crew (all company personnel) compared to the three ships having a crew of 19 (also company personnel). When the ATBs are being loaded or unloaded, the crew supervises the stevedoring personnel to insure cargo is discharged and loaded safely.

ATBs can be combination vessels. The Strong American is a 7,000 horsepower ATB that carries 7200 tons of cargo at 14 knots. The ATB has five decks with a elevator and opening bow for Ro-Ro. Capacity is 450 TEU. Length is 610' and beam 86' with a loaded draft of 14'6", She was built as a Ro-Ro with 16 feet between decks. Range is 12,000 miles and used for niche cargoes to developing countries. Crew is 9-11 of which includes mechanics for reefer containers. As shown in the picture, she carries a ramp for discharge of trailers, hence port infrastructure can be minimal. ATBs are suggested to be versatile for cargoes to include heavy, high and wide. The flexibility does not limit the vessel to specific trade(s) or early obsolescence of the vessel. The Seattle based company is considering an Integrated Tug Barge (ITB) which as compared to an ATB is rigid (pitch and roll the same as the barge) where as the ATB rolls with the barge but has a separate pitch axis. She would carry 600 FEU and be powered by 10,000 horsepower. Barge draft would be 22' to 23' and tug would be 19' to 20'.

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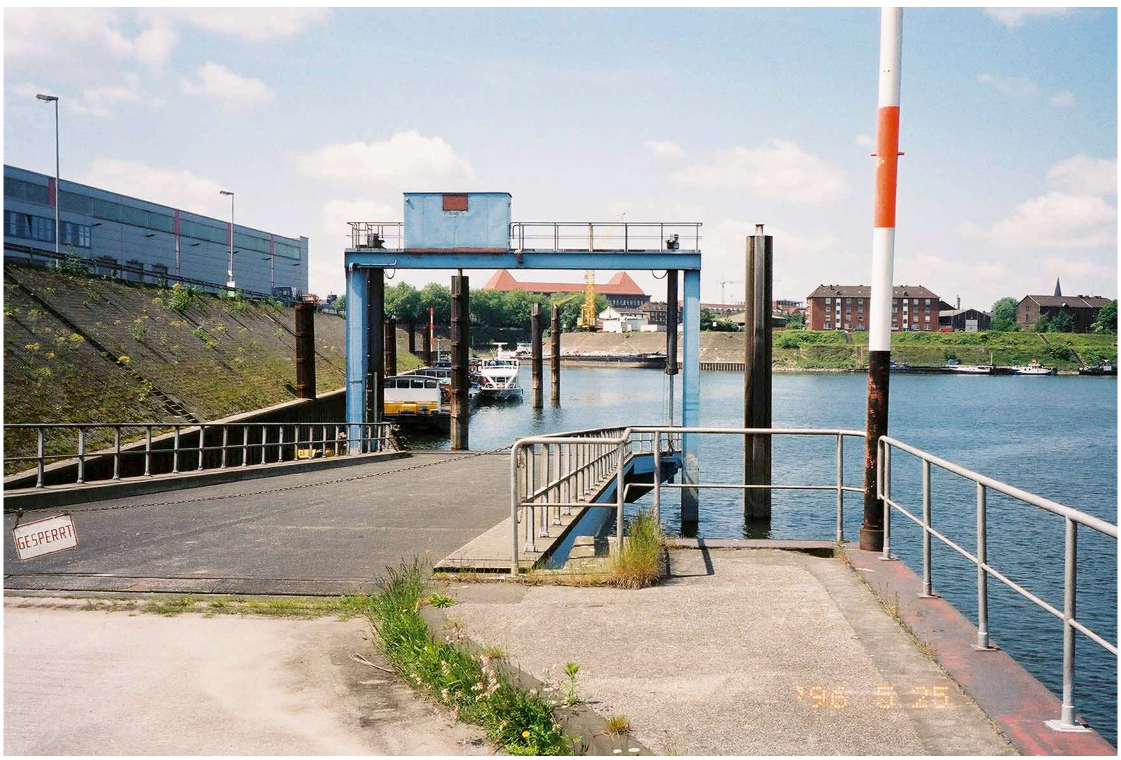
[1] Expanding Role for Articulated Tug-Barges by Brian D. Everist, Pacific Maritime Magazine, April 1999.

8 Ports

For startup operations, the economic conditions for successful ocean barging require efficient port operations with flexibility in productivity. The necessary port structure identified by field visits was either private or of a very small scale. All ports visited used organized labor.

Small inland ports charge under $40 for a one-way container move, either from land to barge or barge to land (throughput). The ports use a straddle (bridge) crane or "Top Picks" for operations. Barge slips are simple concrete structures with metal ramps for RO-RO barges. Shown is the RO-RO ramp at Duisburg, Germany.



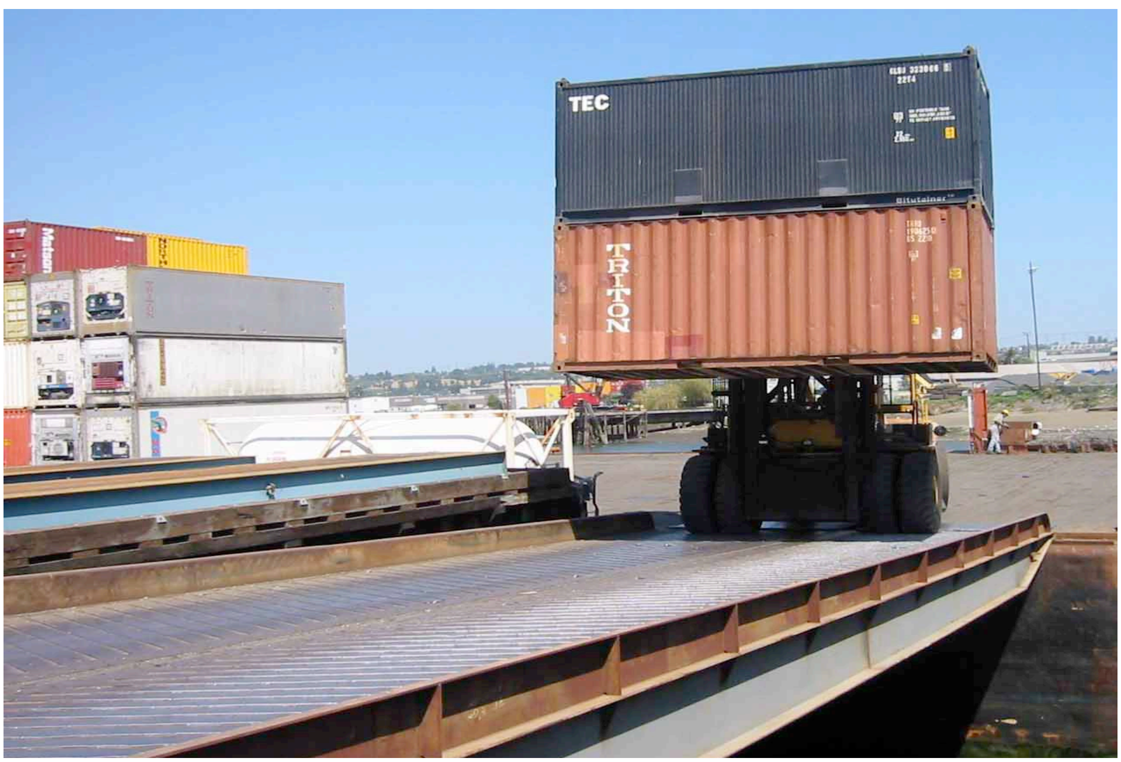
Wharfage (throughput) charges at Duisburg are 19 Euros (about $23). For comparison, the largest container port in Europe, Rotterdam, has a throughput charge of 110 Euros (about $132) for the land move (ship to stack and from stack to truck, rail or barge) and sea move of 120 Euros (about $144) for ship to stack and from stack to ship) employing Post Panamax container cranes.

General "rules of thumb" for container crane moves per hour are: large U.S. West Coast ports at 30 per hour and large U.S. East Coast ports at 25 per hour. Straddle/bridget cranes are in the lower 20s per hour with newer cranes expected to increase the hourly moves.

Although the wharf for a deck barge or RO-RO barge is small, the port area needed for marshalling the containers and trailers is of the size to hold 1200 units (600 for loading and 600 temporary storage for the discharged units at the same time) or about 30 acres for RO-RO (wheeled operation) and one-third the size for container yard with stacking. The containers stacked three high would require about 10 acres. The size is calculated from USDA AMS "A Model for Determining the Maneuvering Space Requirements for Tractor-Trailers at Loading Docks." Using Figure 3 and two deep, the calculations are 15' center to center for the trailers or 26 across an acre of 208' each side (an acre is 208' by 208' or 43,560 square feet). The depth would be 40' plus 40' for two FEU plus 45 minimum turn radius plus 10' of safety margin. The 26 trailers would equal .65 acres thus 1200/26 = 46 parcels times 0.65 or 30 acres.

Flexibility in productivity can be achieved through utilization of the ocean tug or towboat crew when in port. The comparison is the line-haul truck driver unloading palletized cargo or the local delivery truck unloading loose cartons at multiple stops. Deck barges may carry a "Top Pick" which can be operated by the tug/towboat crew to pass containers to a platform on the wharf, which is then moved to the yard, by a dock crew.

Heavy forklifts are the preferred method to avoid downtime when a container crane is under repair. Also, units can be added to increase discharge and loading time from the usual one unit on the barge and one unit on the dock. In addition, should the scheduled terminal have a disruption, another terminal can be temporarily used with the forklifts being transferred to the alternative terminal for the period of time needed. Wharfs will need to have increased loading per square foot to accommodate the weight of the forklifts and the loaded container (some of which may have a gross weight of 92,000 pounds).



(Photo courtesy of Northland Services)

In California, smaller ports were visited; Redwood City (South of San Francisco), Benicia, Eureka, Sacramento, Stockton and Hueneme (Oxnard, CA North of Los Angeles). All have an interested in the project. San Diego, CA showed an interest in cargo from Mexico that would bypass congestion at the Otay Mesa crossing. Shown are pictures of two candidate ports, Hueneme and Rainier, Oregon (across the Columbia River from Longview, WA).

(Photo courtesy of the Port of Hueneme, CA)

(Photo courtesy of Teevin Bros.)

Depth at wharf needs to be at least fourteen feet which is the loaded draft of an ocean deck barges. ATBs require depths from 26 feet to 37 feet.

RO-RO barges of multiple decks may have stern ramps made of concrete to permit all decks to be worked at the same time. Larger barges of up to 600 trailers can be discharged and reloaded in under 18 hours with as little as fifteen hostlers. The securing of the trailer on the barge is by a Pullman standard, i.e. fifth wheel, which takes but a few minutes. A picture of the ramp and multiple level barge is shown.

(Photo courtesy of Crowley Maritime)

Refrigerated trailers will not need dock electrical hook-ups since the mechanical refrigeration unit is diesel engine powered. Refrigerated containers will need port electrical hook-ups, unless there are sufficient generator sets for the container chassis. Refrigerated containers on deck barges can be powered by contained diesel generators, which have a back up generator and fuel storage. These units are in standard 40-foot containers and placed on the deck barge as needed. Shown is a contained unit.

(Photo courtesy of Alaska Marine Lines)

Although barges may have self-loading and discharge cranes such as those shown below, the initial service can be implemented with heavy forklifts which are common units in railroad trailer-on-flatcar yards. Again, permanently attached cranes on barges may be subject to repair downtime whether scheduled or unexpected.

(Photo courtesy of State of Hawaii, Department of Transportation)

The following ports were visited:

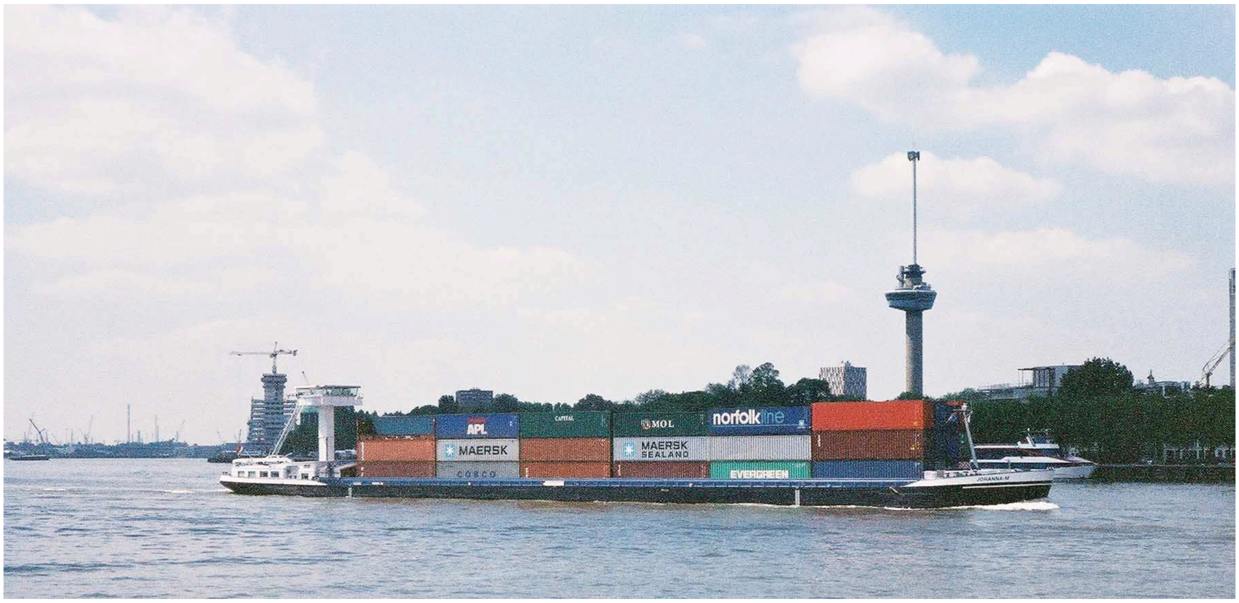
Alaska: Anchorage, Whittier, Kotzebue
California: Eureka, Stockton, Sacramento, Benicia, Redwood City, Los Angeles, Long Beach, Hueneme, San Diego
Florida: Jacksonville, Tampa
Europe: Rotterdam, Hamburg, Duisburg, and Basel
Oregon: Rainier, Morrow
Pacific: Guam, Saipan, Hawaii
Asia: Shanghai, Hong Kong, Pusan
Washington: Everett, Alaska Marine Lines and Northland Services

The preferred port model is a private terminal with owned or leased containers. The containers are picked up from shippers and delivered to receivers by terminal equipment and meet the needs of the shippers; 20, 40, 45, 48 and 53 foot as well as refrigerated. The barge company has complete management control to include security. Wharfage, dockage and handling costs range from $75 to $110 per FEU.

Movement of export cargo in the EU starts as far inland as Basel, Switzerland, the terminus of barging on the Rhine River. This photo at Basel shows the telescoping wheelhouse retracted for bridge clearance.

The next photo shows the compact port of Basel where transfer is to truck or rail. It is interesting to note that the Rhine River from the mouth at Rotterdam to Basel, 820 miles, is not controlled by dams. River barges are shallow draft and during droughts have to adjust the amount of cargo.

The next photo shows a Rhine River barge at Rotterdam. Please note the wheelhouse is extended and that forward masts can be folded back for bridge clearance.



Shown below is a typical Short Seas Shipping vessel that participates on moving the EU 40 percent of total ton-miles of freight via intra and inter coastal. The crew would be between 11 and 13.

(Photos courtesy of Port of Duisburg)

The first of the above two pictures, courtesy of Duisport Agency GmbH, show two container vessels (river going coasters) with approximately 180 TEU capacity (2000 MT) connecting Duisburg directly with the UK (Tilbury). They have approximately 1000 KW (1341 horsepower), a speed of 12 knots, a draft of 320 cm (10.5 feet) and a crew of 6 or 7.

The biggest container river barge presently on the Rhine is the "Amistade" type with approximately 480 TEU, shown in the second picture.

Other Rhine container barges carry approximately 200 TEU. A container barge and push-lighter has about 150 TEU capacity.

The picture below shows one of the big pushers. Capacity is up to 6 lighters of 2800 tons each carrying mainly coal and ore. Draft of lighters is 300 cm (9.8 feet). Generally 4 lighters are pushed at a time.

(Photo Courtesy of Port of Duisburg)